

What is claimed is:

1 1. A video signal including additional information therein, said video signal being
2 characterized in that at least a portion of said additional information has been impressed
3 upon a chrominance portion of said video signal by placing it in at least one selected bit
4 position of a value derived from an average of said chrominance portion over a block of
5 said video signal.

1 2. The invention as defined in claim 1 wherein said portion of said additional
2 information is a bit.

1 3. The invention as defined in claim 1 wherein said additional information
2 replaces at least one bit of said value derived from said average of said chrominance
3 portion over said block.

1 4. The invention as defined in claim 1 wherein said value derived from an
2 average of said chrominance portion over a block of said video signal is the average of
3 the values of said chrominance portion for each pixel of said block.

1 5. The invention as defined in claim 1 wherein said additional information is not
2 substantially perceivable by the human visual system when said video signal including
3 said additional information is displayed on a display device.

1 6. The invention as defined in claim 1 wherein said additional information was
2 impressed by changing the value of said chrominance portion of various pixels of said
3 block, and wherein the magnitude of the change in value any pixel is a function of the
4 amount of change that can be introduced into said pixel without resulting in an artifact
5 that is substantially detectable by the human visual system.

1 7. The invention as defined in claim 1 wherein said additional information was
2 impressed by changing the value of said chrominance portion of various pixels of said
3 block, and wherein the magnitude of the change in value any pixel does not exceed the
4 amount of change that can be introduced into said pixel without resulting in an artifact
5 that is substantially detectable by the human visual system.

1 8. The invention as defined in claim 1 wherein the position of said selected bit is
2 fixed for at least one block of at least one frame of said video signal.

1 9. The invention as defined in claim 1 wherein the position of said selected bit is
2 dynamically determined for at least one block of at least one frame of said video signal.

1 10. The invention as defined in claim 1 wherein the position of said selected bit is
2 determined based on a texture variance of said block.

1 11. The invention as defined in claim 1 wherein said bit position into which said
2 additional information is impressed is a bit of the integer portion of said value derived
3 from said average.

1 12. The invention as defined in claim 1 wherein said block of said video signal is
2 in a reduced resolution format such that for each 2x2 luminance block of an original
3 version of said video signal, had said original version of said video signal been in 4-4-4
4 representation, there remains only one Y, one U, and one V value.

1 13. The invention as defined in claim 1 wherein said average of said chrominance
2 portion over said block of said video signal is a DC coefficient of said block in a
3 frequency domain representation of said block of said video signal.

1 14. The invention as defined in claim 1 wherein said additional information was
2 placed in said at least one selected bit position in a manner that makes a minimum change
3 to said average.

1 15. The invention as defined in claim 1 wherein said additional information was
2 placed in said at least one selected bit position by adding a value to said average so as to
3 make the value of said at least one bit position of said value derived from said average the
4 same as said additional information to be impressed.

1 16. The invention as defined in claim 1 wherein said additional information was
2 placed in said at least one selected bit position by adding a value to said average so as to
3 make said at least one bit position the same in said value derived from said average as
4 said additional information to be impressed while making only a minimum change to the
5 value of said average when impressing said data.

1 17. The invention as defined in claim 1 wherein said additional information was
2 placed in said at least one selected bit position by adding a value to said average so as to
3 make said at least one bit position of said value derived from said average the same in
4 value as said additional information to be impressed, said adding to said average having
5 been achieved by adding an amount to the said chrominance portion of various pixels of
6 said block, said additions to said pixel chrominance portions being made until a total of
7 such additions equals the product of said value and the number of pixels in a block, said
8 additions being independent of any other changes made to the chrominance portion of
9 said pixels.

1 18. The invention as defined in claim 1 wherein said video signal further
2 comprises a margin signal added thereto to reduce the likelihood that said additional
3 information will be eliminated should said video signal undergo quantization

1 19. The invention as defined in claim 1 wherein said video signal further
2 comprises a margin signal added thereto to reduce the likelihood that said additional
3 information will be eliminated should said video signal undergo motion picture experts
4 group (MPEG)-type encoding.

1 20. The invention as defined in claim 1 wherein said additional information was
2 placed in said at least one selected bit position by adding only a minimum necessary
3 amount to said average so that in said value derived from said average said at least one bit
4 position is made to have the same value as said additional information to be impressed
5 and said value derived from said average is within a safe range.

1 21. The invention as defined in claim 1 wherein said additional information is
2 interleaved within said video signal with respect to its ordering prior to undergoing a
3 process to be impressed therein.

1 22. The invention as defined in claim 1 wherein said additional information is
2 channel encoded within said video signal. .

1 23. Apparatus for embedding additional watermarking data within a video signal,
2 comprising:

3 a color selection unit for selecting a chrominance portion of a block of said video
4 signal to carry a portion of said additional watermarking data; and

5 a data adder that adds information to pixels of said block of said video signal
6 thereby causing a change in the average value of said selected chrominance portion so as
7 to incorporate at least a portion of said additional watermarking data within said changed
8 average value.

1 24. The invention as defined in claim 23 wherein said color selection unit
2 comprises a prestored table in computer readable form that indicates for each area within
3 at least a colorspace portion which chrominance portion should be selected for pixels
4 within said each area.

1 25. The invention as defined in claim 23 further comprising a block interleaver
2 that interleaves said additional watermarking data prior to said additional watermarking
3 data being incorporated within said changed average value.

1 26. The invention as defined in claim 23 further comprising a channel encoder
2 that channel encodes said additional watermarking data prior to said additional
3 watermarking data being incorporated within said changed average value.

1 27. The invention as defined in claim 23 wherein said data adder modifies only a
2 said selected chrominance portion of said pixels and further comprising a multiplexer for
3 multiplexing at least the unmodified chrominance portion of said pixels and said
4 modified chrominance portion of said pixels.

1 28. The invention as defined in claim 23 wherein said data adder further
2 comprises a bit mapper.

1 29. The invention as defined in claim 23 wherein said data adder further
2 comprises a texture masking unit that determines a amount of change in said chrominance
3 portion that a pixel can endure while minimizing the likelihood of a visible artifact
4 resulting, and wherein said data adder adds no more than said amount to said pixel.

1 30. The invention as defined in claim 23 wherein said data adder adds a further
2 value to pixels of said block of said video signal thereby causing the resulting new
3 average value to be within a safe range.

1 31. The invention as defined in claim 23 wherein said data adder changes said
2 average value by the least amount necessary to carry said additional watermark data.

1 32. The invention as defined in claim 23 wherein said data adder adds a further
2 value to pixels of said block of said video signal thereby causing the resulting new
3 average value to be within a safe range and wherein said data adder further adds to pixels
4 of said block the value that changes said average value by the least amount possible.

1 33. The invention as defined in claim 23 wherein said video signal has the same
2 resolution before and format after being watermarked by said video signal, but wherein
3 said apparatus operates in a reduced resolution format such that for each 2x2 luminance
4 block of an of said video signal before watermarking, had said video signal before
5 watermarking been in 4-4-4 representation, there remains only one Y, one U, and one V
6 value in said reduced resolution format of said video signal.

1 34. Apparatus for embedding additional watermarking data within a video signal,
2 comprising:

3 means for selecting a chrominance portion of a block of said video signal to carry
4 a portion of said additional watermarking data;

5 means for causing a change in the average value of said selected chrominance
6 portion so as to incorporate at least a portion of said additional watermarking data within
7 said changed average value.

1 35. The invention as defined in claim 34 wherein said means for causing a change
2 changes said average value by placing in a selected bit position thereof at least a portion
3 of said additional information.

1 36. The invention as defined in claim 34 wherein said means for causing a change
2 changes said average value by placing in a selected bit position thereof at least a portion
3 of said additional information and further changes said average value so it is within a safe
4 range.

1 37. The invention as defined in claim 34 wherein said means for causing a change
2 effectuates said change in said average value by changing the values of said selected
3 chrominance portion of one or more of the pixels of said block.

1 38. A method for use in extracting watermark data from a watermarked video
2 signal, wherein said watermark data is carried in at least one bit position of an average of
3 the values of a chrominance portion of the pixels of at least one block of at least one
4 frame, the method comprising the step of:

5 selecting a chrominance portion that is likely to be carrying said watermark data in
6 said average of said values of said chrominance portion for said block;

7 extracting said watermark data from said average of said values of said selected
8 chrominance portion.

1 39. The invention as defined in claim 38 further comprising the step of
2 determining which bit position of said average of said values is carrying said watermark
3 data, and wherein said extracting step extracts the value of said bit position.

1 40. The invention as defined in claim 38 further comprising the step of
2 determining which bit position of said average of said values is carrying said watermark
3 data as a function of a busyness of said block, and wherein said extracting step extracts
4 the value of said bit position.

1 41. The invention as defined in claim 38 wherein said determining step further
2 comprises the steps of:

3 making a determination for each pixel in said block as to which chrominance
4 portion is most likely to tolerate a change in its value and not introduce thereby a visible
5 artifact; and

6 choosing as said selected chrominance portion the chrominance portion that was
7 determined in said making step for the most pixels of said block.

1 42. The invention as defined in claim 41 wherein said determination in said
2 making step is made for at least one pixel of said block as a function of a prestored table
3 in computer readable form that indicates for each area within at least a colorspace portion
4 which chrominance portion should be selected for pixels within said each area.

1 43. The invention as defined in claim 41 wherein said determination in said
2 making step is made for at least one pixel of said block as a function of a calculation that
3 indicates which chrominance portion should be selected for a pixel as a function of values
4 of said pixel.

1 44. The invention as defined in claim 38 further comprising the step of
2 deinterleaving said watermark data after it is extracted.

1 45. The invention as defined in claim 44 further comprising the step of channel
2 decoding said deinterleaved extracted watermark data.

1 46. The invention as defined in claim 38 further comprising the step of channel
2 decoding said extracted watermark data.

1 47. The invention as defined in claim 38 further comprising the step of
2 computing said average of the values of said chrominance portion of the pixels of said at
3 least one block of said at least one frame from the values of said chrominance portion of
4 said pixels of said at least one block of said at least one frame.

1 48. The invention as defined in claim 38 wherein said block of said video signal
2 is in a reduced resolution format such that for each 2x2 luminance block of an original
3 version of said video signal, had said original version of said video signal been in 4-4-4
4 representation, there remains only one Y, one U, and one V value.

1 49. The invention as defined in claim 48 further comprising the step of
2 decimating an original video signal to produce said watermarked video signal with a
3 reduced resolution format such that for each 2x2 luminance block of said original video
4 signal, had said original video signal been in 4-4-4 representation, there remains only one
5 Y, one U, and one V value.

1 50. A receiver for use in extracting watermark data from a watermarked video
2 signal, wherein said watermark data is carried in at least one bit position of an average of
3 the values of a chrominance portion of the pixels of at least one block of at least one
4 frame, said receiver comprising:

5 a color selector for indicating which chrominance portion is likely to be carrying
6 said watermark data in said average of said values of said chrominance portion for said
7 block;

8 a block integrator for computing said average of said values of said chrominance
9 portion for said block; and

10 a bit selector that supplies as an output said watermark data from said average of
11 said values of said selected chrominance portion.

1 51. The invention as defined in claim 50 further comprising a block variance
2 calculator that determines, based on at least one texture variance of said block, which bit
3 position of said average of said values of said selected chrominance portion should be
4 supplied as said watermark data by said bit selector.

1 52. The invention as defined in claim 51 a decimator that produces said
2 watermarked video signal from an original video signal such that for each 2x2 luminance
3 block of said original video signal, had said original video signal been in 4-4-4
4 representation, there remains only one Y, one U, and one V value in said watermarked
5 video signal.

1 53. A processor for embedding additional watermarking data within a video
2 signal, said processor being operative:

3 to select a chrominance portion of a block of said video signal to carry a portion
4 of said additional watermarking data; and

5 to cause a change in the average value of said selected chrominance portion so as
6 to incorporate at least a portion of said additional watermarking data within said changed
7 average value.

1 54. Software in computer executable format for embedding additional
2 watermarking data within a video signal, said software comprising:

3 a module to select a chrominance portion of a block of said video signal to carry a
4 portion of said additional watermarking data; and

5 a module to a change in the average value of said selected chrominance portion so
6 as to incorporate at least a portion of said additional watermarking data within said
7 changed average value.

1 55. Apparatus for use in extracting watermark data from a watermarked video
2 signal, wherein said watermark data is carried in at least one bit position of an average of
3 the values of a chrominance portion of the pixels of at least one block of at least one
4 frame, said apparatus comprising:

5 means for selecting a chrominance portion is likely to be carrying said watermark
6 data in said average of said values of said chrominance portion for said block; and

7 means for extracting said watermark data from said average of said values of said
8 selected chrominance portion.

1 56. A method for use in extracting watermark data from a watermarked video
2 signal, wherein said watermark data is carried in at least one bit position of an average of
3 the values of a chrominance portion of the pixels of at least one block of at least one
4 frame, said method comprising the steps of:

5 selecting a chrominance portion is likely to be carrying said watermark data in
6 said average of said values of said chrominance portion for said block; and

7 extracting said watermark data from said average of said values of said selected
8 chrominance portion.

1 57. Apparatus for for embedding watermarking data within a video signal,
2 comprising:

3 means for receiving a video signal in a frequency domain based format; and

4 means for changing a DC coefficient of at least one block of said video signal to
5 carry at least a portion of said watermarking data.